

# **Careers in Engineering**

# ***What does an engineer do?***

- Old saying “An engineer can do with one dollar what any fool can do with two!”
- Trained to use science, technology, and mathematics to solve problems in a systematic way

# ***What types of engineers are there?***

- ***Civil Engineering***
- Structural (buildings, bridges, tunnels)
- Transportation (highways, railroads, canals)
- Environmental (air pollution management)
- Water resources (flood control)
- Geotechnical (mining)
- Surveying & Construction

# ***What types of engineers are there? (continued)***

- ***Mechanical Engineering***
- Energy (power plants, heating and air conditioning, alternative energy)
- Structures and motion in mechanical systems (cars, planes, machine tools, medical systems)
- Manufacturing (tools and processes, automated assembly lines, robotics)

# ***What types of engineers are there? (continued)***

- ***Chemical Engineering***
- Design and operate any plant that involves a chemical process
- Plastics and other petroleum products
- Building materials
- Food products
- Pharmaceuticals
- Clothing
- Fertilisers
- Environmental cleanup

# ***What types of engineers are there? (continued)***

- ***Electrical Engineering***
- 36 technical societies with broad areas
- Electronics (circuits, microchips, lasers)
- Communications (cell phones, antennas, networks, fibre-optics)
- Power (transmission and distribution of power, electric motors, and generators)
- Controls (automated control systems, aerospace control systems)
- Instrumentation (test equipment)

# ***What types of engineers are there? (continued)***

- ***Computer Engineering***
- Hardware (computers, data storage)
- Software (programming, operating Systems)
- Digital systems
- Computer architecture
- Networks

# ***What types of engineers are there? (continued)***

- ***Industrial Engineering***
- Industrial Engineers determine the most effective way for an organisation to use its resources (people, machines, materials, information and energy)
- People oriented engineers
- Must know computers and management practices



# ***What types of engineers are there? (continued)***

- ***Other Major Special Types***

- Aerospace
- Materials / Metallurgical (removing metal from the ore, refining, alloying)
- Bioengineering (engineering and medicine)
- Agricultural (genetic engineering)
- Mining / Geology
- Many - many - many - specialties

# ***How Does An Engineer Do Things***

- Client has a problem or sees an opportunity
- The engineer:
  - defines the problem and collect information and data about the problem
  - develops alternative designs or solutions (Usually more than one way to solve the problem)
  - identifies and compares the pros and cons of each solution

# ***How Does An Engineer Do Things (continued)***

- helps the client determine the best choice for the best price
- designs and manufactures the selected product
- trains others to use and support the new product
- continues development and improvement of the product
- finds other uses for the product

# ***What can you expect from an engineering career?***

- Varied opportunities (opens the door to many areas)
- Challenging work (brain exercise)
- Social impact (improving our way of life)
- Prestige (engineering is a well respected profession)
- Lifelong education (always new things to learn about)
- How do they do that (curiosity)
- Creative thinking (dreaming)

# Engineers and Scientists

- Scientists seek technical answers to understand natural phenomenon
- Engineers study technical problems with a practical application always in mind
- For example
  - “Scientists study atomic structure to understand the nature of matter; engineers study atomic structure to make smaller and faster microchips”

# The Engineer and the Engineering Technologist

- Main difference between the two is:
  - Engineers design and manufacture machines and systems, while engineering technologists have the technical know-how to use and install the machines properly
- An example:
  - “The technologist identifies the equipment necessary to assemble a new CD player; the engineer designs the CD player”

# What Do Engineers Do?

- Ways to get information about careers:
  - Visit job fairs
  - Attend seminars on campus by various employers
  - Contact faculty with knowledge of engineering fields
  - Get an intern or co-op position
  - Enroll in an engineering elective course

**HOW  
ENGINEERS  
FUNCTION???**



# Engineering Functions:

- **Research**
- **Development**
- **Testing**
- **Design**
- **Analysis**
- **Systems**
- **Manufacturing & Construction**
- **Operations & Maintenance**
- **Technical Support**
- ❖ **Customer Support**
- ❖ **Sales**
- ❖ **Consulting**

# Engineering Functions: Research

- Research engineers are knowledgeable in principles of chemistry, biology, physics, and mathematics
- Computer know-how is also recommended
- A Masters Degree is almost always required, and a Ph. D is often strongly recommended

# Engineering Functions: Development

- Development engineers bridge the gap between the laboratory and the production facility
- They also identify problems in a potential product
- An example is the development of concept cars for companies like Ford and GM

# Engineering Functions: Testing

- Testing engineers are responsible for testing the durability and reliability of a product, making sure that it performs how it is supposed to, every time. T.E.s simulate instances and environments in which a product would be used
- Crash testing of a vehicle to observe effects of an air bag and crumple zone are examples of a testing engineer's duties

# Engineering Functions: Design

- Design aspect is where largest number of engineers are employed
- Design engineers often work on components of a product, providing all the necessary specifics needed to successfully manufacture the product
- Design engineers regularly use computer design software as well as computer aided drafting software in their jobs

# Engineering Functions: Design

- Design engineers must also verify that the part meets reliability and safety standards required for the product
- A concern always on the mind of design engineers is how to keep the development of a part cost effective, which is taken into account during a design process

# Engineering Functions: Analysis

- Analysis engineers use computational tools and mathematic models to enrich the work of design and research engineers
- Analysis engineers typically have a mastery of: heat transfer, fluid flow, vibrations, dynamics, acoustics, and many other system characteristics

# Engineering Functions: Systems

- Responsible on a larger scale for bringing together components of parts from design engineers to make a complete product
- Responsible for making sure all components of a product work together as was intended by design engineers



# Engineering Functions: Manufacturing & Construction

- Work individually or in teams
- Responsible for “molding” raw materials into finished product
- Maintain and keep records on equipment in plant
- Help with design process to keep costs low

# Engineering Functions: Operations & Maintenance

- Responsible for maintaining production line
- Must have technical know-how to deal w/ problems
- Responsible for inspecting facility and equipment, must be certified in various inspection methods

# Engineering Functions: Technical Support

- Works between consumers and producers
- Not necessarily have in depth knowledge of technical aspects of product
- Must have good interpersonal skills

# Engineering Functions: Customer Support

- Often have more of a technical knowledge than Tech. Support, because they must be able to work with basic customers
- Evaluate whether or not a current practice is cost effective via feedback from customers

# Engineering Functions: Sales

- Sales engineers have technical background, but are also able to communicate effectively w/ customers
- Job market for sales engineers is growing, due to the fact that products are becoming more and more technically complex

# Engineering Functions: Consulting

- Are either self-employed, or work for a firm that does not directly manufacture products
- Consulting engineers might be involved in design, installation, and upkeep of a product
- Sometimes required to be a registered professional engineer in the state where he/she works